AD-A162 789 COSTCASTER: A COST PREDICTION AND TRADE-OFF MODEL FOR AIR FORCE GROUND COMMUNICATIONS-ELECTRONICS EQUIPMENT (U) DESMATICS INC STATE COLLEGE PA D E SMITH 20 SEP 85 1/1

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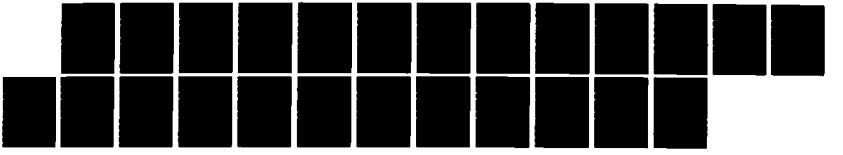

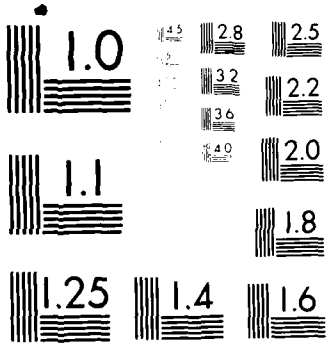

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COSTCASTER: A Cost Prediction and Trade-Off Model For Air Force Ground Communications-Electronics Equipment

by

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ABSTRACT

COSTCASTER is a cost-prediction and trade-off model currently under development by Desmatics, Inc. for the Air Force. The model is designed for use as a decision aid in determining whether to modify, replace, or retain items of Air Force ground communications-electronics (C-E) equipment. This paper briefly describes a microcomputer-based COSTCASTER prototype developed in Lotus 1-2-3 on a Zenith Z-100.

INTRODUCTION

COSTCASTER is a computerized cost analysis decision aid developed for the Air Force Logistics Command by Desmatics, Inc. It helps in deciding whether to modify, replace or retain items of Air Force ground communications-electronics (C-E) equipment.

COSTCASTER, which has been implemented in prototype form on the Zenith Z-100 microcomputer using Lotus 1-2-3 software, is designed for ease of use even by persons having no computer experience. Menus are displayed at every major decision point to guide the user through the interactive cost analysis sessions.

O&S COST PREDICTION

COSTCASTER is designed to use a historical data base of operating and support (O&S) cost information derived from the Air Force Visibility and Management of Operating and Support Costs (VAMOSC) system. COSTCASTER uses statistical methods to predict O&S costs for individual types of C-E equipment items based on the historical cost data. Specifically, the cost predictions are based on the following regression equation:

$$C_t = (\alpha t^{\beta})\varepsilon_t \quad ; \; t = 1, 2, 3, \ldots$$

where C_t is the cost for year t,

α and β are the parameters to be estimated,

and ε_t is the statistical error term.

This regression equation is highly flexible, fitting a variety of typical situations (e.g., initial high costs which decrease and then level out over time, initially increasing costs which level out, or initially constant costs which "blow up" as equipment ages). Because it is also simple, this regression equation can be fit and corresponding prediction intervals calculated using only three years of historical data.

ECONOMIC TRADE-OFF ANALYSIS

COSTCASTER trade-off analysis allows the user to compare the predicted O&S costs for an existing item of equipment with the costs expected to be incurred by an alternative item (i.e., a replacement or modification). The trade-offs performed in COSTCASTER are based on the economic analysis methods outlined in AFR 178-1 (Economic Analysis and Program Evaluation for Resource Management) and AFP 178-8 (Economic Analysis Procedures Handbook).

To perform a trade-off analysis, the user provides estimates of a few quantities, such as the expected economic life of the alternative item. (Default estimates, supplied by COSTCASTER, may be used if desired.) COSTCASTER makes it easy for the user to conduct a "what-if" analysis by experimenting with alternative sets of estimates and assessing the results. At any point in the model the user may change inputs, save the model, and/or exist COSTCASTER.

OUTPUT

COSTCASTER provides immediate output which summarize the results of the cost prediction and trade-off analysis. The following reports are available:

Payback Table and Graph - Cumulative savings, exclusive of depreciation, over the lifetime of the current item for varying reductions in O&S costs

Displacement Table and Graph - Effect on savings of delaying purchase

Life Savings Table and Graph - Total savings, including depreciation, over the lifetime of the current item for varying reductions in O&S costs and varying lifetimes of the replacement item

These tables and graphs, which are displayed on the computer screen, may also be output on the printer.

ADDITIONAL INFORMATION

As mentioned, COSTCASTER currently exists in prototype form only. Current Air Force plans call for the production version to be available in FY87. The implementation of the production version will involve, among other things, the construction of a database management system to access and update the VAMOSC C-E data, and the preparation of a user's guide.

Further details on COSTCASTER are given in the following three Desmatics technical reports:

No. 118-4, "Methodology Underlying COSTCASTER, A Cost-Prediction and Trade-Off Model for Air Force Ground C-E Equipment" (ADA155369), October 1984.

No. 118-8, "Prototype Implementation of COSTCASTER, A Cost-Prediction and Trade-off Model for Air Force Ground C-E Equipment," July 1985.

No. 118-9, "COSTCASTER, Cost-Prediction and Trade-off Model for Air Force Ground C-E Equipment: Microcomputer Feasibility Study," August 1985.

Copies of the briefing slides are attached.

COSTCASTER: A COST PREDICTION AND TRADE-OFF MODEL FOR AIR FORCE GROUND COMMUNICATIONS-ELECTRONICS EQUIPMENT

Presented by
Dennis E. Smith
Desmatics, Inc.

Life Cycle Costing Workshop
19th Annual DOD Cost Analysis Symposium
September 1985

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COSTCASTER

- PREDICT O&S COSTS
- IDENTIFY MODIFICATION/REPLACEMENT CANDIDATES
- PERFORM ECONOMIC TRADE-OFF ANALYSIS

COSTCASTER

COST COMPARISON CONSIDERATIONS

CURRENT ITEM

- HISTORICAL O&S COSTS
- FUTURE O&S COSTS

REPLACEMENT ITEM

- ACQUISITION COST
- ECONOMIC LIFE
- O&S COST REDUCTION

COSTCASTER

- DATABASE MANAGEMENT SYSTEM
- COST-PREDICTION AND TRADE-OFF MODEL

COSTCASTER

- INPUT ASSUMPTIONS
- CALCULATE COST PREDICTIONS
- PERFORM TRADE-OFF ANALYSIS

COST PREDICTIONS IN COSTCASTER

- REGRESSION MODEL: $C_t = (\alpha t^{\beta})\varepsilon_t \quad t = 1, 2, 3...$

  -PARSIMONIOUS

  -CAN REFLECT A VARIETY OF SITUATIONS

  -PROVIDES A REASONABLE FIT TO HISTORICAL DATA

- USER OPTIONS:

  -SELECTION OF COST CATEGORIES

  -MODIFICATION OF COST DATA

  -WEIGHTING OF COST DATA

- OUTPUTS:

  -PREDICTED COSTS

  -95% PREDICTION INTERVALS

  -PREDICTION DIAGNOSTICS

ECONOMIC TRADE-OFFS IN COSTCASTER

- ECONOMIC ANALYSIS METHODS OUTLINED IN:
  - -"ECONOMIC ANALYSIS AND PROGRAM EVALUATION FOR RESOURCE MANAGEMENT" (AFR 178-1)
  - -"ECONOMIC ANALYSIS PROCEDURES HANDBOOK" (AFP 178-8)

- COMPARISONS INVOLVING:
  - -PRESENT VALUE OF O&S COSTS
  - -PRESENT VALUE OF ACQUISITION COSTS
  - -RESIDUAL VALUE OF EQUIPMENT

- TABULAR AND GRAPHICAL OUTPUTS:
  - -EXPECTED NET TOTAL SAVINGS OVER PAYBACK PERIOD
  - -EXPECTED TOTAL SAVINGS OVER LIFE OF CURRENT EQUIPMENT
  - -EXPECTED TOTAL SAVINGS IF REPLACEMENT IS DELAYED

Operating and Support Cost Summary

TMS: AN/FCC-00 (FY85 Dollars)

COST CATEGORIES	INCLUDE	FY80	FY81	FY82	FY83	FY84
Total O & S Cost		55,145	54,739	54,447	52,182	54,761
UNIT MISSION PERSONNEL (UMP)						
Operations	Y	12,491	14,476	16,461	17,111	17,624
Base Maintenance	Y	12,237	12,874	13,295	11,072	13,889
Administrative	Y	1,706	1,449	1,595	1,353	1,523
Supply Support	Y	555	413	456	534	668
INDIRECT PERSONNEL COST (IPC)						
Temporary Duty Travel	Y	170	80	114	107	186
Permanent Change Station	Y	896	322	456	676	891
Medical	Y	170	121	152	178	186
Advanced Training	Y	0	0	0	0	0
UNIT LEVEL CONSUMPTION (ULC)						
Fuel	Y	0	0	0	0	0
Maintenance Materiel	Y	3,549	3,141	2,431	2,100	2,265
Electric Utilities	Y	1,492	1,289	1,140	1,104	1,077
DEPOT MAINTENANCE (DM)	Y	16,720	16,105	13,978	13,493	13,035
DEPOT NON-MAINTENANCE (DNM)						
General Depot Support	Y	42	40	76	71	111
Transportation & Packaging	Y	810	1,127	798	930	484
Engineering Support	Y	0	0	0	0	0
REPLACEMENT INVESTMENT (RI)	Y	2,602	1,731	1,975	1,780	1,448
INSTALLATION SUPPORT (IS)						
Base Operating Support	Y	852	564	684	783	557
Real Property Maintenance	Y	511	604	494	498	483
Communications	Y	342	403	342	392	334

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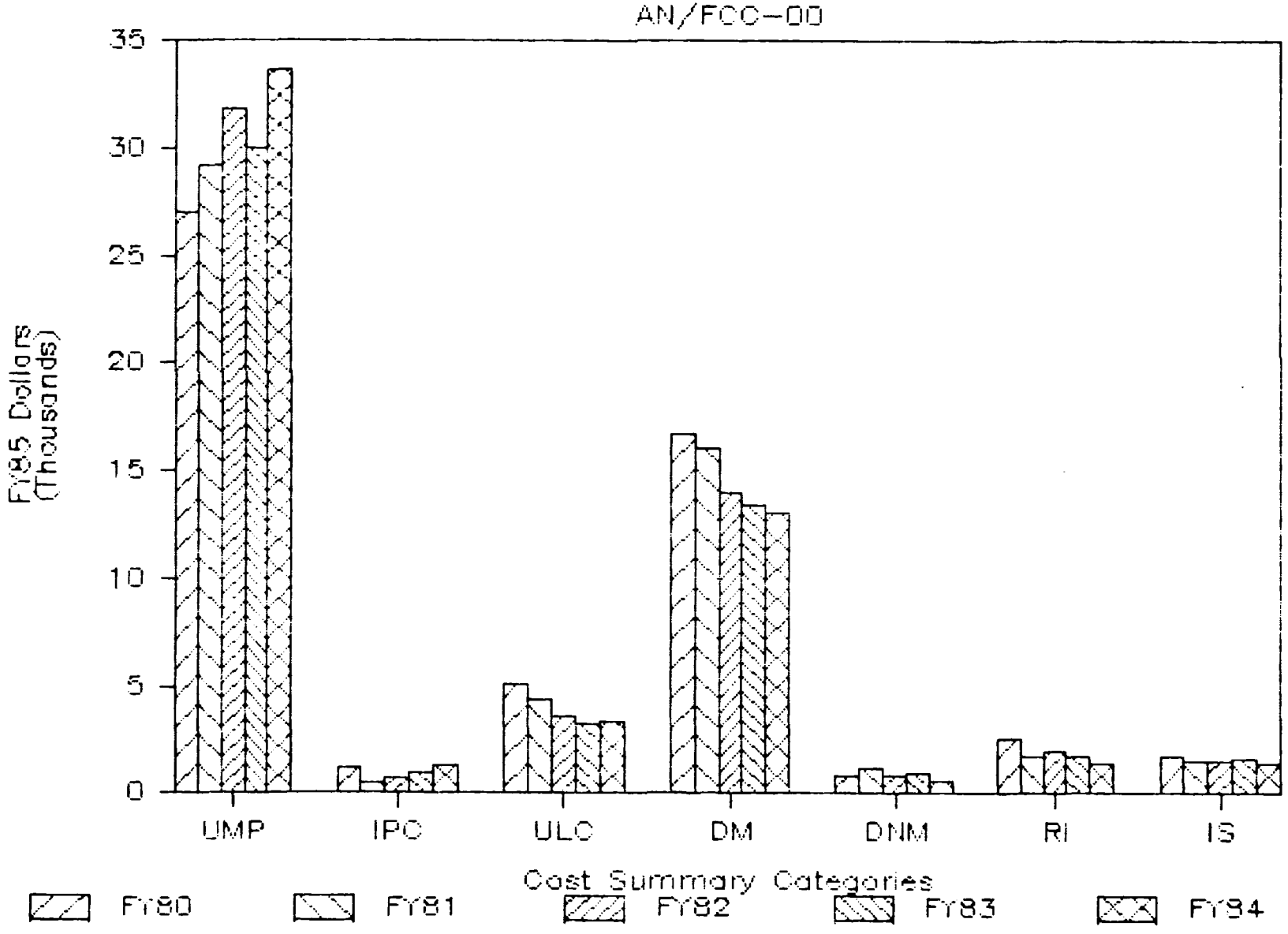
OPERATING AND SUPPORT COST SUMMARY



COST PREDICTIONS FOR THE AN/FCC-00

Predicted cost for year t = 55,155 *t** -0.0174 (FY85 $)

FY	Weight	t	Actual	Prediction	95% Prediction Interval
80	1.00	1	55145	55155	
81	1.00	2	54739	54494	
82	1.00	3	54447	54111	
83	1.00	4	52182	53842	
84	1.00	5	54761	53633	
85		6		53463	(48861 , 58500)
86		7		53320	(48502 , 58617)
87		8		53197	(48174 , 58743)
88		9		53088	(47873 , 58971)
89		10		52991	(47596 , 58998)
90		11		52903	(47340 , 59120)
91		12		52823	(47102 , 59239)
92		13		52750	(46881 , 59354)
93		14		52682	(46674 , 59463)
94		15		52619	(46479 , 59569)

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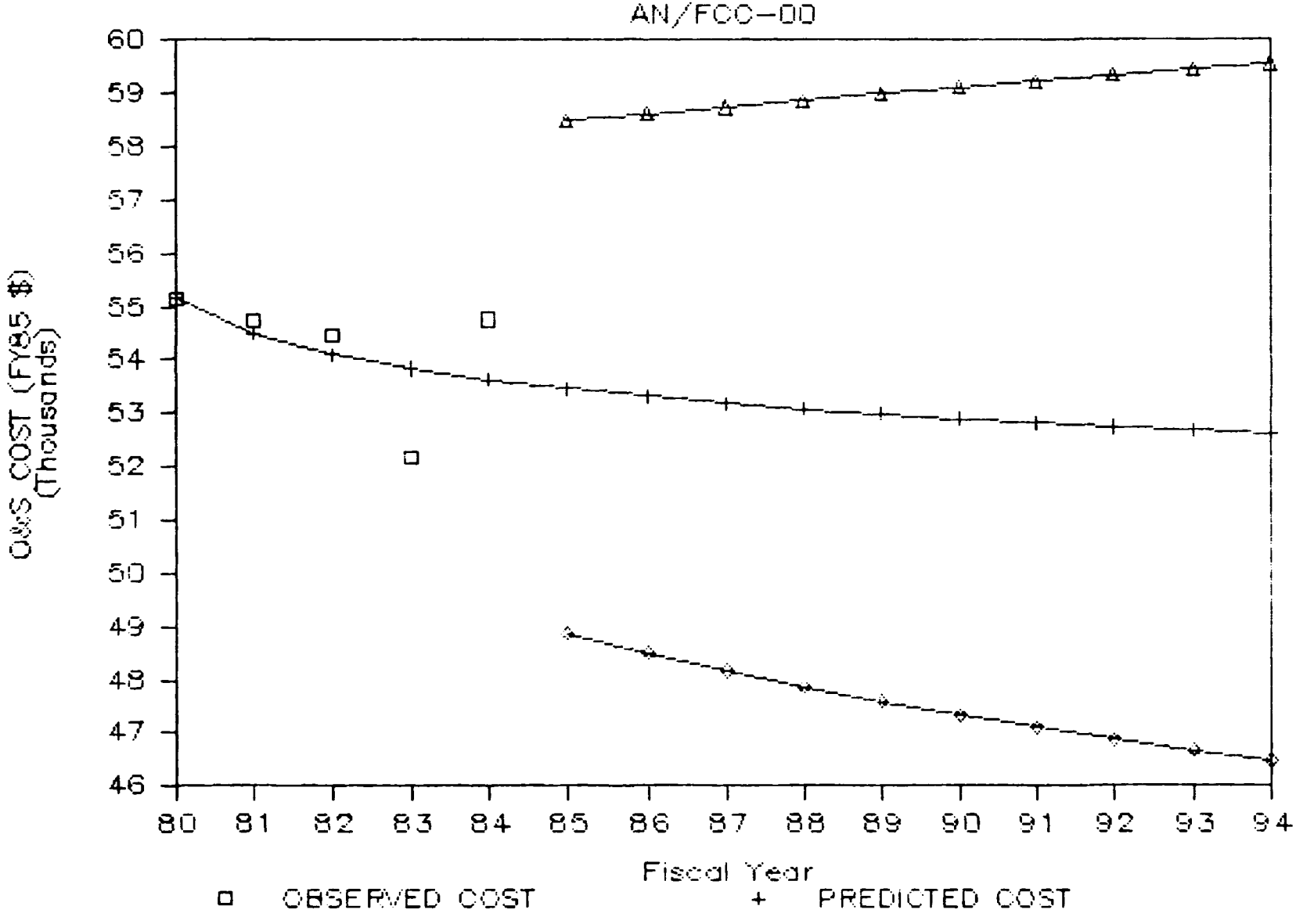
PREDICTIONS & PREDICTION INTERVALS



Trade-Off Assumptions

Current economic life of the AN/FCC-00		10 years
Economic life of replacement/modified TMS		15 years
Discount rate		10 %
Acquisition cost replacement/modified TMS	$	65,000
Expected O&S cost reduction range	10 % -	30 %
Expected overall O&S cost reduction		20 %

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SAVINGS REALIZED BY REPLACING/MODIFYING AN/FCC-00 (FY85 $)

Discount Rate 10% Acquisition Cost 65,000
Current Life 10

Year	Range of Reduction in O&S Costs				
	10.00%	15.00%	20.00%	25.00%	30.00%
1	-60140	-57710	-55279	-52849	-50419
2	-55733	-51100	-46466	-41833	-37199
3	-51736	-45104	-38473	-31841	-25209
4	-48110	-39665	-31221	-22776	-14331
5	-44820	-34730	-24640	-14550	-4460
6	-41834	-30251	-18668	-7084	4499
7	-39123	-26185	-13246	-308	12631
8	-36662	-22493	-8325	5844	20013
9	-34428	-19142	-3856	11430	26716
10	-32399	-16099	201	16502	32802

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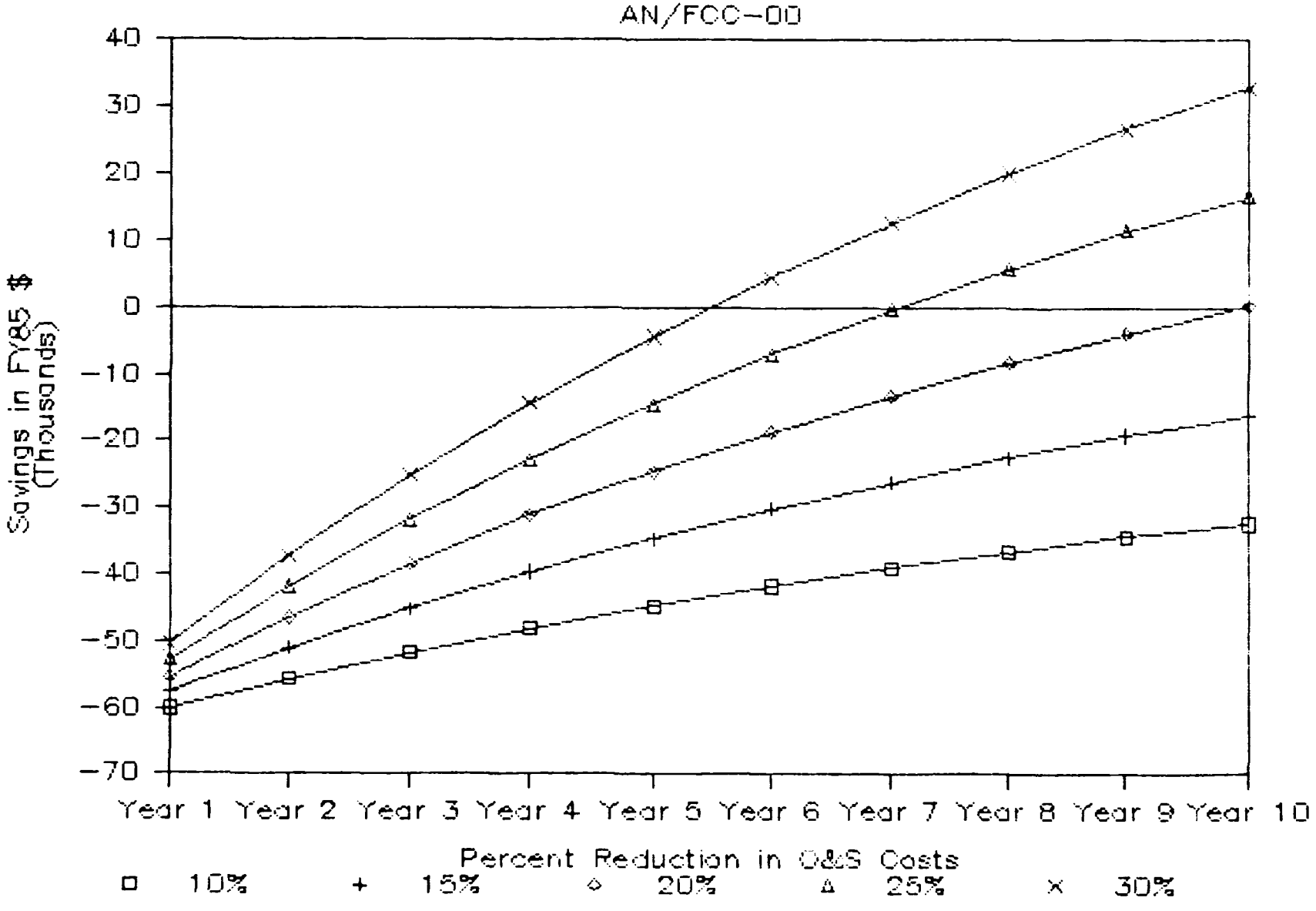
SAVINGS REALIZED BY REPLACING



REPLACEMENT OF AN/FCC-00

Total Savings (FY85 $) over 10 years depending on life of the replacement. 10% Discount, 65,000 Acquisition Cost

Replacement Life	Range of Reduction in O&S Costs 10.00%	15.00%	20.00%	25.00%	30.00%
10	-32399	-16099	201	16502	32802
11	-30121	-13821	2479	18780	35080
12	-28223	-11922	4378	20678	36979
13	-26616	-10316	5984	22285	38585
14	-25239	-8939	7361	23662	39962
15	-24046	-7746	8555	24855	41155
16	-23002	-6701	9599	25899	42199
17	-22080	-5780	10520	26821	43121
18	-21261	-4961	11339	27639	43940
19	-20529	-4228	12072	28372	44673
20	-19869	-3569	12731	29032	45332
21	-19273	-2972	13328	29628	45929
22	-18730	-2430	13871	30171	46471

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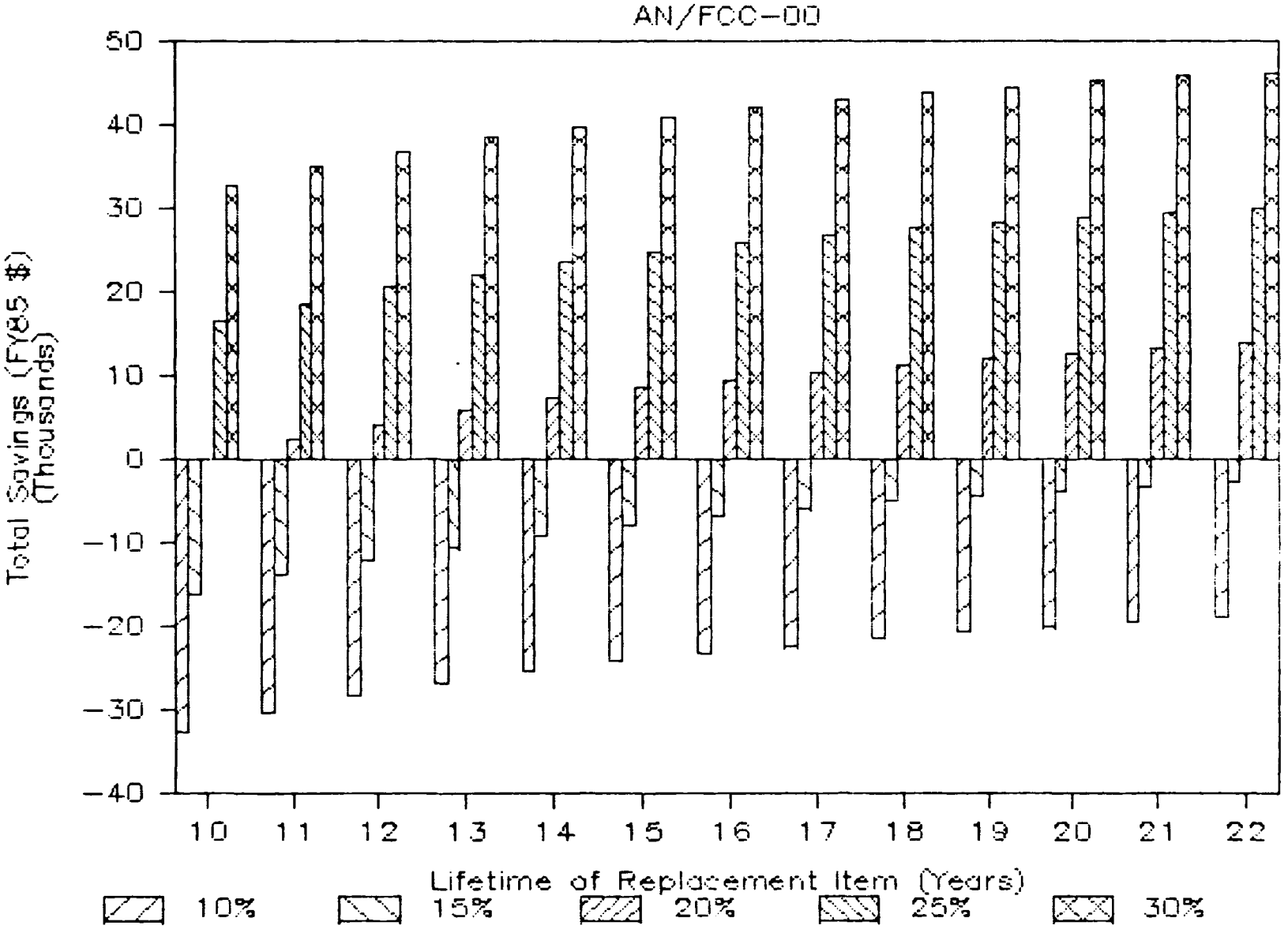
EFFECTS OF % REDUCTION ON SAVINGS



DISPLACEMENT TABLE FOR AN/FCC-00

Discount Rate	10%	Acquisition Cost	65,000
Current life	10	% Reduction in	
Replacement Life	15	O&S costs	20%

Years to Replacement	Total Savings Over Current Life	Savings if Replacement is Not Immediate (FY85 $)
0	8555	
1	6414	-2141
2	4643	-3912
3	3204	-5351
4	2062	-6492
5	1188	-7366
6	556	-7999
7	140	-8414
8	-78	-8633
9	-119	-8674
10	0	-8555

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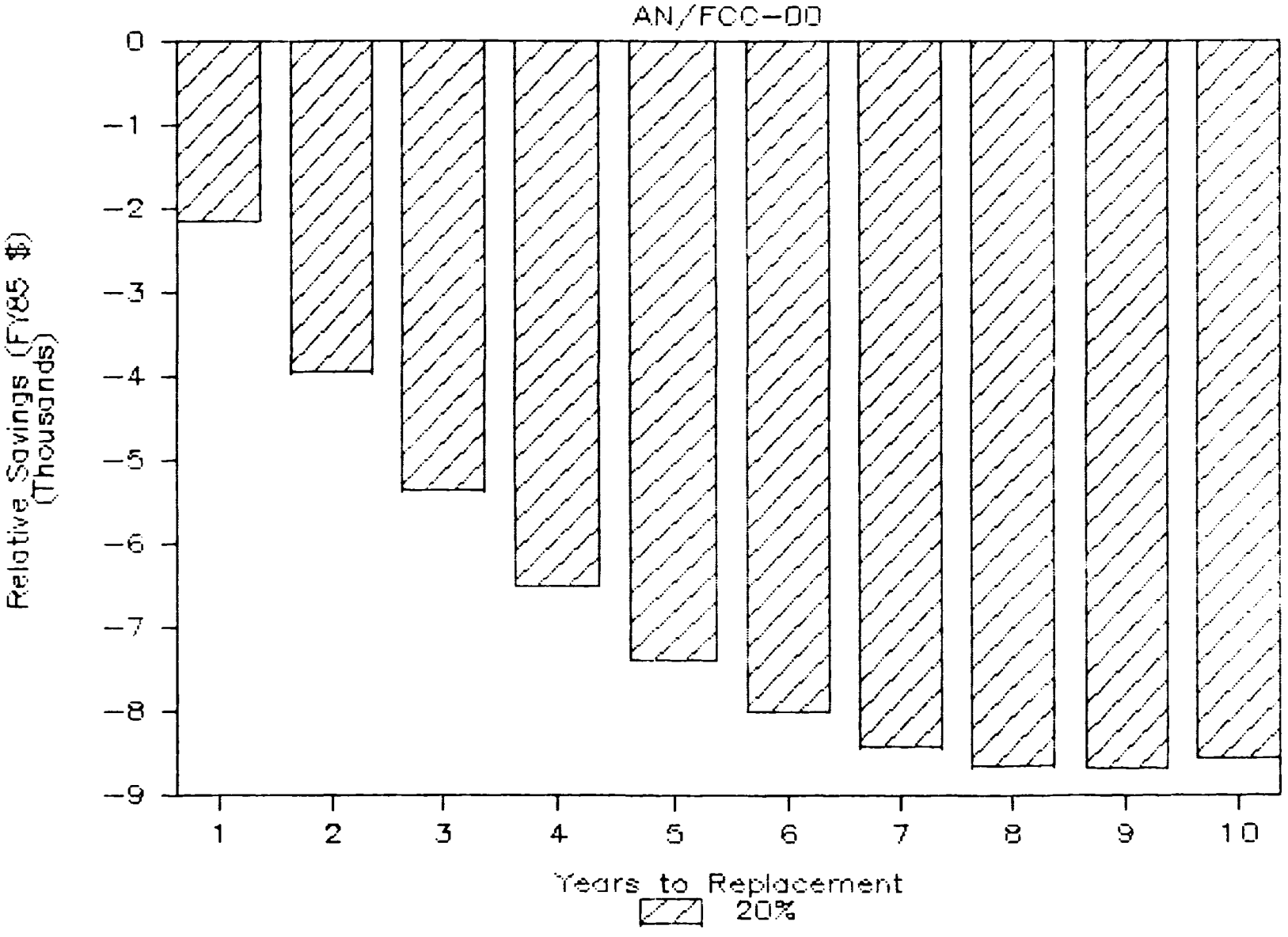
SAVINGS REALIZED BY DELAYING PURCHASE



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